ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

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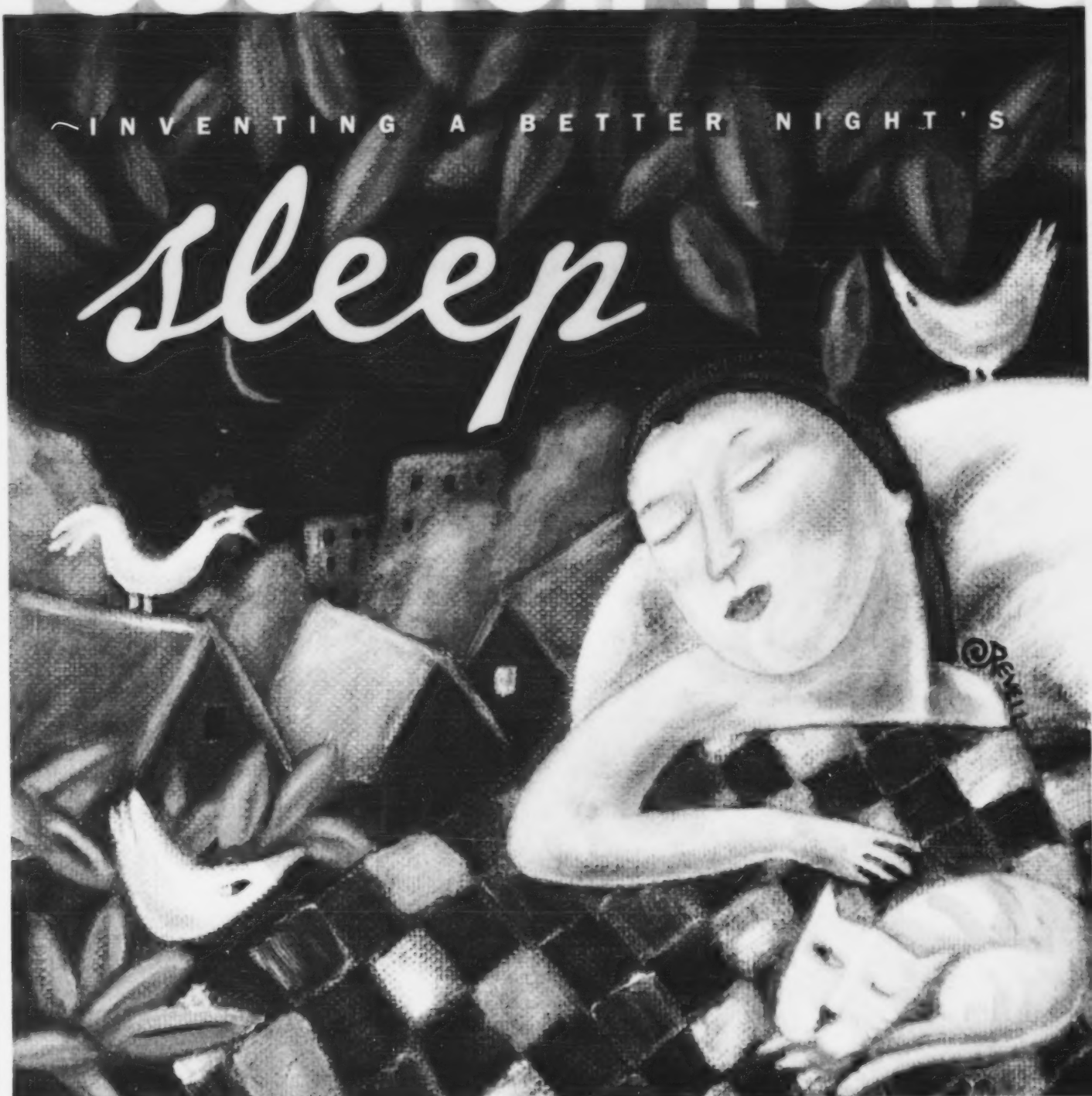
SUMMER 2001

research news



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Regular features

AHFMR Mission

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Contact Us:

Your comments, views and suggestions are welcome. Please forward them to:

The Editor, AHFMR Research News
Alberta Heritage Foundation
for Medical Research
Suite 1500,
10140 - 103 Avenue
Edmonton, Alberta T5J 4A7

Phone: (780) 423-5727
Fax: (780) 429-3509
E-Mail: postmaster@ahfmr.ab.ca
Internet: http//www.ahfmr.ab.ca

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Production Notes

Managing editor: Kathleen Thurber
Writers: Connie Bryson, Beth Duthie, Rhonda Lothammer, Mark Lowey, Kathleen Thurber
Design: Lara Minja, Lime Design Inc.
Artwork, page 6: Helen Mackie, Courtesy of the Alberta Foundation for the Arts
Cover and inside illustrations: Cindy Revell
Photography: Trudie Lee, John Gaucher, Calgary; Roth and Ramberg, Edmonton; Candy Li, U of A Creative Services; Eyewire

The AHFMR Newsletter is published four times annually and is distributed free of charge to a controlled circulation list within Canada. If you wish to receive it, please contact us by phone, e-mail, fax or by letter. It is also on the web at www.ahfmr.ab.ca.

AHFMR Research News is printed by Speedfast Color Press on 70lb Luna Matte text.

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ISBN: 1896956319

Canadian Publications Agreement #1602004.

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In Canada,

Most people might not be very aware of these examples, but for Dr. Devidas Menon they're top-of-mind. Dr. Menon, Executive Director and CEO of Alberta's Institute of Health Economics, is a specialist in the area of pharmaceutical policy. "There's a huge variation among provincial formularies in which drugs are listed, which ones aren't, and which ones are listed with special conditions," he explains. "And the differences are not only between provinces–various regions have different policies regarding pharmaceuticals. It's a real mishmash.

"The situation begs the question: Do we really have fairness? Are some people in some provinces not receiving effective drugs? Are they receiving less effective drugs than they could be?"

Total spending on pharmaceuticals in Canada is more than $10.8 billion per year. Pharmaceuticals account for an increasing proportion of healthcare expenditures by governments, individuals, and insurance companies. Issues of access to prescribed medications, appropriateness of use, and out-of-pocket cost burden are coming to the forefront of health and healthcare policy debates.

The variation in Canadian pharmaceutical guidelines relates to how administrative and budgetary decisions are made. "The policies governing the regulation and financing of pharmaceuticals are myriad," notes Dr. Menon. "We make many policy interventions, yet we don't know what their effects are. Very little evaluation is being done in Canada.

Are some people in some provinces not receiving effective drugs?

We say decisions are based on evidence, yet financial and political realities often mean that research-based evidence is overlooked."

The Institute is attempting to address this situation with the establishment of a "knowledge broker" program. Recruiting has begun for a number of researchers in key areas who can link the work done by healthcare researchers and analysts to issues faced by decision-makers. Their work will cover critical issues related to the use of pharmaceutical products and other healthcare interventions.

"Knowledge brokers will make their expertise available to the regional health authorities, initially Calgary and Edmonton," explains Dr. Menon. "We hope to have an effect on the way policy is made by informing the decision-making process with high-quality scientific evidence."

The Institute of Health Economics is an independent, not-for-profit organization whose mission is to improve health through the advancement of health-services research and improved decision-making in healthcare. One of its main research areas is pharmaceutical policy. The Institute has produced a significant amount of research describing pharmaceutical policy in Canada and other countries, and measuring the economic, clinical, and human consequences of those policies. In 1999, it was one of six academic research organizations in the world to receive a Merck Company Foundation grant to support research on pharmaceutical policy. Many of the researchers associated with the Institute are AHFMR-funded Research Fellows.

revolution

Traditional 40-hour workweeks don't leave much room for sleepless nights or for tending to personal demands that fall between 9 a.m. and 5 p.m. However, there are two growing trends in the workplace that allow flexibility in organizing work and home lives: telecommuting, where employees work away from the office for all or part of the week; and flex-time, where they help set their own hours.

The concept of the flexible work environment has been around, and applied in one form or another, since the 1970s, but only with the digital revolution of the last decade has telecommuting really "taken off".

"You can imagine that advances in computers and telecommunications have had a substantial impact on the way work is organized, but it's a relatively under-researched area," says Heritage researcher Dr. James Smythe. He's looking at the social and economic costs of telecommuting, as part of a larger study on flexible work schedules. The three-year project will examine whether workers who set their own hours are healthier than workers whose hours are set for them. "Work is an important part of many people's lives, so experiences in the workplace are bound to affect their health," Dr. Smythe says.

His own schedule, which includes teaching a graduate course in health economics at the University of Alberta as well as working on his research project, gives Dr. Smythe first-hand knowledge of the workplace options he studies.

"I'm not tied down to my office. I can work from home most days," he explains, "and if I'm not feeling particularly creative one day, I can take it off. I balance that by working 14 hours or more on other days when I am in that creative groove." Greater productivity is just one of the benefits of a flexible work schedule, Dr. Smythe says. "It's less stressful, too. You can be creative when you're feeling that way, and not force yourself when you're not."

As part of his research, the health economist is sifting through employment-survey data to get an idea of the various types of jobs people hold and the amount of flexibility that goes along with them. A recent Statistics Canada survey, for example, shows that more and more employers are implementing telecommuting and flex-time options in the workplace. An estimated 2.3 million employees work some scheduled hours at home, while 5.2 million have a flexible work schedule.

Besides finding out whether workers on flex-time are happier and healthier, Dr. Smythe's study will examine how such work schedules affect their households and the wider population. "If workers have a flexible schedule, they can also meet the health needs of the rest of their family—whether it's looking after an elderly parent or a sick child. On a larger scale, if these workers aren't on the road commuting to work, they will be less likely to contribute to traffic congestion, car accidents, and air pollution," he says. "If they're sick with the flu, they'll be more likely to stay home longer and not spread it among their co-workers."

While flexible work schedules may sound appealing, they may not be right for everyone, Dr. Smythe cautions. "Some people enjoy structure, and some thrive

The concept of the flexible work environment has been around since the 1970s.

While flexible work schedules may sound appealing, they may not be right for everyone.

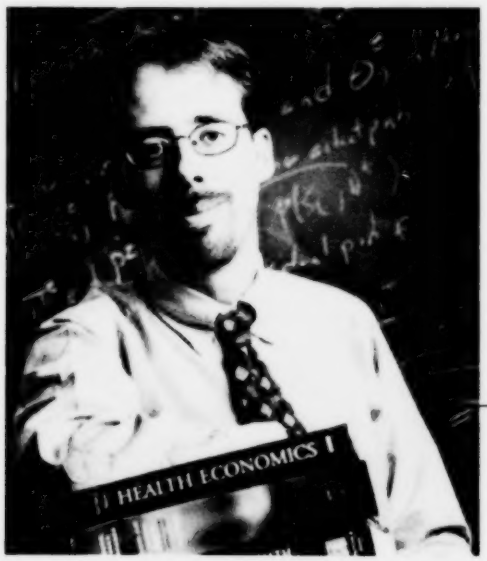
ABOVE: DR. JAMES SMYTHE

at work

on the social networking they get from an office environment. These people probably wouldn't make good telecommuters." In addition, while their families might be happier, some workers might feel pulled in two directions, Dr. Smythe suggests. Nevertheless, many workers find that they appreciate the flexibility, in order to balance their personal lives while still meeting the demands of their jobs. One way or another, it seems that flexible working arrangements may be the way of the future.

Dr. James Smythe is a Heritage Population Health Investigator and an Assistant Professor in the Department of Economics in the University of Alberta's Faculty of Arts. He receives additional support from the National Health Research and Development Program, now part of the Canadian Institutes of Health Research (CIHR).

Recent publication:
Smythe JG. "The impact of a flexible workplace on worker health." Working paper to be presented at the 2001 Canadian Health Economics Research Association (CHERA) conference.



working well

DR. CHRIS AULD

Unemployed people have poorer mental health than those who have jobs, according to epidemiological studies. But economist and Heritage Population Health Investigator Dr. Chris Auld wants to know what exactly the relationship is between the two. Does being unemployed undermine a person's mental health? Or is a person who is mentally unwell less able to hold a job? Or is some other factor associated with both unemployment and mental health status?

Dr. Auld, an Assistant Professor in the Department of Economics at the University of Calgary, studies the economics and econometrics of health-related behaviour, including areas such as health and the labour market, and economic epidemiology (the relationship between economics and population health).

Econometrics combines the power of statistics, including computer-run mathematical models, with well-established economic theory. "In this context, we can't do controlled experiments on people," Dr. Auld says. "So all this modelling and statistical work takes the place in economics of controlled experimentation."

Several epidemiological studies have shown that—with the exception of very heavy drinkers—the more alcohol people drink, the more money they make. But does this statistical correlation mean that health policy-makers should encourage people to consume more alcohol if they want a bigger paycheque? Hardly. In fact, Dr. Auld says, such correlations indicate that researchers and policy-makers need a better, more precise tool to look at the cause-and-effect relationships between a number of variables, such as alcohol and tobacco consumption or drug abuse, and such outcomes as income, employment, or education.

"If you can get better estimates of the relationship between people's health and productivity in the economy, then that can help with directing health care, health promotion, and health research dollars," says Dr. Cam Donaldson, a Heritage Senior Scholar and the Svare Chair in Health Economics at the University of Calgary.

Dr. Auld had considered going to law school, but decided to major in economics after taking some undergraduate courses in the subject. "I had some good undergraduate teachers," he says. As part of his Ph.D. thesis, he applied econometrics to a database started in 1984 to track 670 gay men in San Francisco at risk of HIV infection. As the database also asked retrospective questions about sexual behaviour it covered a period from the late 1970s to 1991.

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Researchers and policy-makers need a better, more precise tool to look at the cause-and-effect relationships between variables such as alcohol consumption and income.

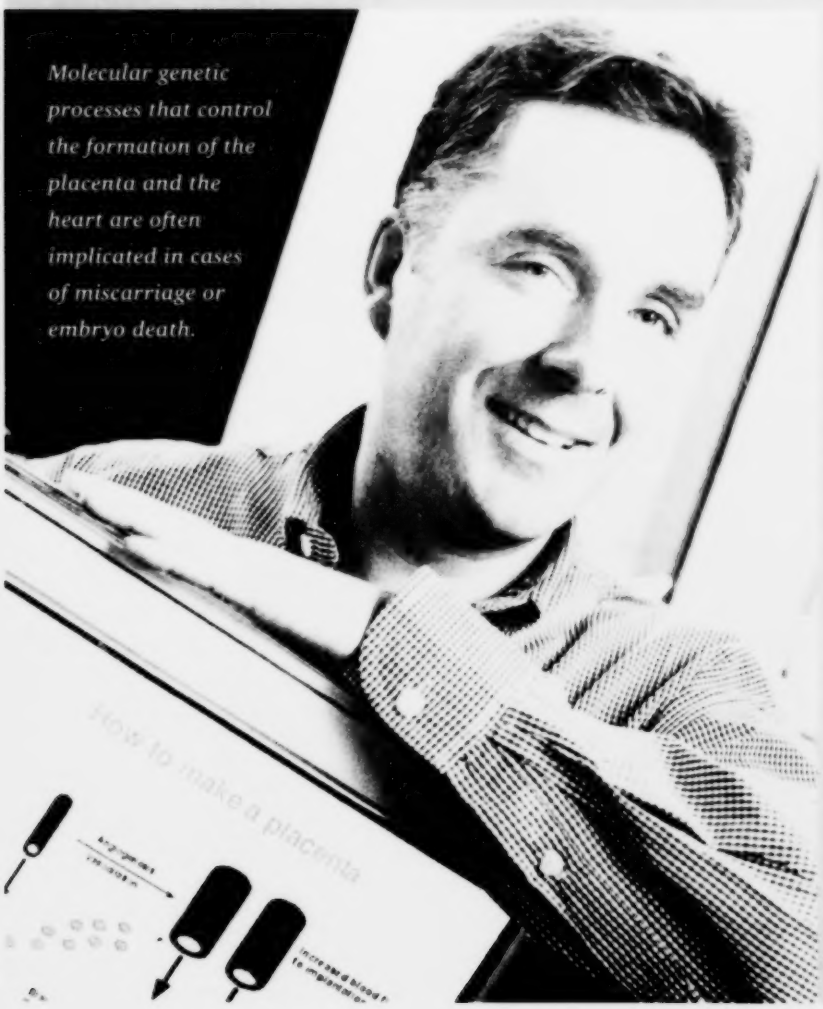
Questioning the fundamentals of life

Dr. Jay (James) Cross likes to say that his research involves asking "stupidly simple" questions. Simple they may be, but their answers could hold the keys to regenerating human organs, preventing life-threatening birth defects and stopping cancer in its tracks.

Dr. Cross, a Heritage Senior Scholar, is investigating the fundamental biology of the earliest stages of embryonic development in mammals. Using the laboratory mouse as a model, he studies the molecular genetic processes that control the formation of the placenta and the heart. "Both of those organ systems are critical for embryonic development and fetal growth," says Dr. Cross, "and they're often implicated in cases of miscarriage or embryonic mortality."

Dr. Cross's work focuses on three main areas of embryonic development: cell fate, cell cycle, and organogenesis.

The question he asks about cell fate is: How do stem cells, the precursor cell line in the developing embryo, differentiate and give rise to some 200 cell types in the human body? If he and other scientists can answer these fundamental questions about the controls in stem cells that lead to cell differentiation, it would break ground for new therapies. Although such therapies are still years away, the hope is that someday precursor stem cells could be implanted in people to regenerate diseased or damaged organs.



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Dr. Cross's work in cell cycle is focused on how some cells replicate their DNA—their genetic blueprint—without actually undergoing mitosis (cell division). These polyploid cells are part of normal embryonic development and are found in such organ systems as the placenta, the liver, and the brain. Understanding the molecular controls that let polyploid cells synthesize DNA without dividing could potentially uncouple these same processes in cancer cells. Then, one type of therapy could be developed to stop the cell from replicating its genetic blueprint, while another could be aimed at preventing cell division. "You'd have a two-pronged approach to treating cancer," Dr. Cross notes.

Organogenesis is the interaction of specialized cell types to form organs. Here the question, as Dr. Cross puts it, is: "How do those cells interact with each other to give rise to a coordinated organism, so we can build tape recorders and dress ourselves in the morning?"

Figuring out how individual genes control the interaction of cells to form organs could lead to less invasive gene-based therapies for such birth defects as abnormal heart development in newborns, and for damaged hearts in adults.

Dr. Cross and his colleagues have identified a gene, called Hand1, that is crucial for normal development of both the placenta and the heart.

The team has pinpointed another gene, Gcm1, that controls how precursor stem cells specialize into various cell types to create the complex branching tissue in the placenta. This happens in less than a day in the developing embryo. Defects in this Gcm1 gene may be implicated in two conditions that complicate 5% to 10% of human pregnancies: Pre-eclampsia and intrauterine growth restriction cause miscarriages, deaths of newborns, and smaller-than-normal babies.

Thanks to advancements in gene technology, "now we can selectively activate genes that are of interest, or whole combinations of genes, and see the interaction and the outcome," Dr. Cross says.

Dr. Cross credits his Ph.D. supervisor, Dr. Michael Roberts at the University of Missouri, and his post-doctoral supervisor, Dr. Zena Werb at the University of California at San Francisco, with inspiring his enthusiasm for asking the "stupidly simple" questions.

Dr. Cross is an AHFMR Senior Scholar, an Associate Professor in the Department of Biochemistry and Molecular Biology in the Faculty of Medicine at the University of Calgary, and a member of the Genes and Development Research Group. He also receives support from the CIHR, the National Cancer Institute, and the Heart and Stroke Foundation of Canada.

Recent publications:

Hemberger M, Cross JC. Genes governing placental development. [Review] *Trends in Endocrinology and Metabolism* 2001; 12:162-168.

Anson-Cartwright L, Dawson K, Holmyard D, Fisher SJ, Lazzarini RA, Cross JC. The glial cells missing-1 protein is essential for branching morphogenesis in the chorioallantoic placenta. *Nature Genetics* 2000; 25: 311-314.

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However, econometric models also revealed that an increase in the probability a partner is infected today will usually decrease current rates of partner change. This is linked to people's perceptions about advances in HIV and AIDS treatment. If uninfected people are optimistic about future treatments, they may limit the number of partners they have. They want to reduce their chances of being infected until an effective treatment is found. On the other hand, uninfected people who don't think a vaccine will ever be found or think that it would be too far in the future, may choose to have many partners. They are assuming, especially given dire predictions, they'll be infected anyway and no therapy is in sight.

"People's behaviour with respect to HIV reflects not only their fears about getting infected currently, it also reflects what they believe is going to happen with respect to new treatments in the future," he says. Simple models ignore this complex behavioural response; they just extrapolate from current infection rates.

Econometrics, however powerful as a research tool, is unable to account for all the subtlety and complexity of human behaviour, Dr. Auld notes. "Researchers must then reduce the complexity by making strong, simplifying assumptions—the source of both the models' explanatory power and their limitations."

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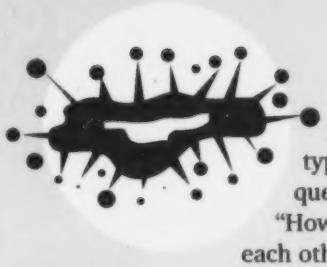

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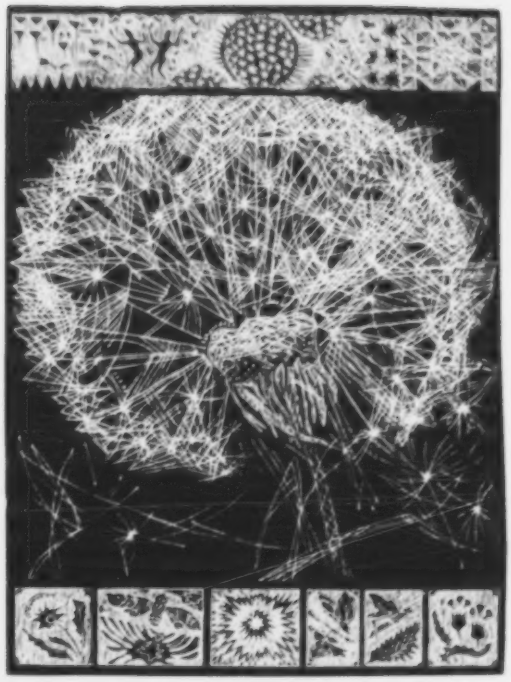
Auld C. Choices, beliefs, and infectious disease dynamics. Working paper #938, Queen's University Institute for Economic Research. Resubmitted at request of American Economic Review.

First presented to her as a "little project on neurons", Heritage scholar Dr. Elena Posse de Chaves' research is now anything but little. Her work has expanded into an intensive study of a signalling molecule involved in both the regeneration of damaged nerve cells and the death of nerve cells in diseases such as Alzheimer's and stroke.



Brainworks

Dr. Posse de Chaves began this research in 1993 when she joined Dr. Jean Vance's lab in the Lipid and Lipoprotein Research Group at the University of Alberta. She had come to the U of A as a post-doctoral fellow after finishing her Ph.D. at the University of Tucuman in Argentina. She had specialized in the biophysics of lipids.

Dr. Vance suggested that Dr. Posse de Chaves study the role of lipids (fats) in the growth of neurons (nerve cells). It was then that she developed an interest in sphingolipids, a group of lipids that have been studied since the late 1800s, but their function was thought to be entirely related to maintaining membrane structure. Over the last two decades, however, scientists have found that sphingolipids also play an active role as signalling molecules: They allow cells to respond to external stimuli such as hormones, growth factors, or radiation.

One of the sphingolipids, ceramide, exists in all cells and plays a particularly important signalling role in neurons, but it was not clear exactly what ceramide did or how it worked. These questions intrigued Dr. Posse de Chaves. The neuron project would be a bit of a stretch because it involved a lot of work with primary nerve cells. It was a challenge she readily accepted.

"This was what I love about doing research in Canada," Dr. Posse de Chaves explains. "When I came to Canada, I wasn't fully aware of what I was capable of doing in terms of research, because in Argentina we are so limited by a lack of money and facilities. When Jean talked about the neuron project, I thought, "Wow, now I'll really find out what I can do."

"Finally I had the opportunity to explore my ideas like never before. Exploring your ideas is what research is all about. I enjoy the challenge; it is very fulfilling."

As Dr. Posse de Chaves developed her own interests in ceramide, it became clear that her work would take her beyond the scope of the "little project" originally envisaged. Ceramide was turning out to be a lipid that plays a complex role in the functioning of neurons. For one thing, it inhibits the regeneration of the long, filament-like axons that

ARTWORK THIS PAGE: HELEN MACKIE. *WORLD OF DANDELION*. WOODCUT ON PAPER. 61.0 X 45.6 CM. 1993. COURTESY OF THE ALBERTA FOUNDATION FOR THE ARTS.

extend outward from the neuron's cell body. Axons carry information away from the cell body to other neurons or to target tissues.

"Axonal degeneration without subsequent regeneration occurs after spinal cord injury and in various degenerative diseases," says Dr. Posse de Chaves. "If we could find out what is going on—how ceramide works to inhibit regeneration—we might have an opportunity to use this knowledge to stimulate axonal regeneration."

Paradoxically, ceramide also protects certain populations of nerve cells from apoptosis (the process by which a cell actively commits suicide). On the one hand, it is essential to normal development and continued health, while on the other hand, its failure to regulate apoptosis has been implicated in a variety of diseases, including Alzheimer's, Parkinson's and stroke. Modulation of ceramide could be a useful target for drugs to treat these diseases.

Essential to the ceramide studies is an experimental system designed by Heritage Medical Scientist Dr. Robert Campenot. The compartmented-culture system allows cell bodies to grow their axons out to different sections of a dish, instead of in a tangle. Using this model, Dr. Posse de Chaves can study metabolic events occurring in the axons independently of what is going on in the cell bodies. Axonal growth can be measured precisely, and axonal regeneration can be evaluated under controlled conditions.

Dr. Posse de Chaves became an Assistant Professor of Pharmacology in 1999. She continues her research as a member of the U of A's Signal Transduction Research Group, as well as teaching undergraduate and graduate courses and supervising graduate students.

"What we're seeing from our research is that ceramide works through more than one pathway," she explains. "Its function in regulating axonal growth suggests that it prevents nerve growth factor from being taken up by neurons. But this is by no means the only way ceramide works. There are many pathways.

"But my research isn't only about identifying pathways; it's about finding out where in the cell all this activity is occurring. We have preliminary evidence that the mechanism of action differs depending on where ceramide is produced: whether it's in the plasma membrane or deeper inside the cell."

There is also evidence that ceramide affects the trafficking (movement and interraction) of proteins. Dr. Posse de Chaves hopes to follow this research up with a collaborative study involving several other researchers in the Signal Transduction Research Group.

"My research is part of an international effort aimed at solving very fundamental problems—how to regenerate nerve cells and how to stop the death of cells in neurological diseases," she says. "Every little piece of information we gain, every process we come to understand, will help.

"Will modulation of ceramide be a cure? I can't say that, but I do believe it's a piece of the puzzle."

Dr. Elena Posse de Chaves is an AHFMR Scholar who also receives support from the Canadian Institutes of Health Research. She held an AHFMR post-doctoral fellowship from 1994 to 1996.

Recent publications:

Posse de Chaves EI, Vance DE, Campenot RB, Kiss RS, Vance JE. Uptake of lipoproteins for axonal growth of sympathetic neurons. *Journal of Biological Chemistry* 2000; 275: 19883-19890.

Posse de Chaves EI, Bussière M, Vance DE, Campenot RB, Vance JE. Elevation of ceramide within distal neurites inhibits neurite growth in cultured rat sympathetic neurons. *Journal of Biological Chemistry* 1997; 272: 3028-3035.

Dr. Lam laughs about it now. He took his mentor's advice and became a dentist, but he knew he had aspirations beyond setting up his own general practice. "There are a lot of really fun things about being a dentist, but I didn't think I could drill, fill, and scrape teeth for 35 years of my life," the new Heritage researcher reflects. That realization led him to a career in research, and ultimately landed him a position in the Faculty of Dentistry at the University of Alberta. He is now among the few academic dentists in North America.

Dr. Alan Hannam, the same professor who convinced Dr. Lam to stay in dental school, also encouraged him to get a master's degree and offered him a job working in his lab. It didn't take much to convince Dr. Lam to continue in academics once he learned of the innovative techniques his mentor was using to examine the jaw muscles. "Back in the late 1980s, researchers in dentistry were starting to use MRIs to study the jaw joints," Dr. Lam explains. "They were using the technique to look at the joints but not the rest of the head and neck. I thought it would be a good tool for looking at those areas, too."

After finishing his master's degree, the budding scientist headed off to the University of Iowa for a clinical residency in oral radiology. When one of his professors there won a National Institutes of Health (NIH) grant to study oral cancer, he invited Dr. Lam to join his research team. "He thought having a dentist on board would add credibility to his work on cancers of the mouth," Dr. Lam says.

Oral cancer is an often-disfiguring disease that is currently treated with radiation and surgery, for a cure rate of only about 50%. "Conventional treatments are physically quite devastating," Dr. Lam explains. "Huge chunks of your face are often carved away. Also, salivary glands can be irradiated to the point where they can stop producing saliva, resulting in a very dry mouth and problems associated with that." The major causes of oral cancer are smoking and chewing tobacco. Consumption of hard liquor is a contributing factor to the disease.

Following his residency, Dr. Lam won a grant of his own from the Medical Research Council of Canada (now the Canadian Institutes for Health Research) that allowed him to pursue a Ph.D. in radiation biology in Dr. Larry Oberley's lab. His dissertation research focused on the role of free radicals in oral cancer. A journal article he was reviewing at the time, concerning the release of free radicals in nicotine, intrigued him enough to research the concept further. "I noticed that nicotine and nitrosamine metabolites of nicotine looked similar to compounds that spontaneously release nitric oxide," Dr. Lam

"'If something in your life doesn't work out, you can always be a dentist.'"

That's the sage advice a supportive professor gave a disillusioned Emile Lam back in dental school. "All of those years when I was working in frustration, he kept saying, 'Don't quit! Don't quit!'"

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After finishing his Ph.D., Dr. Lam set out to find a job that would allow him to continue his initial work, but bring him home to Canada. "There were a lot of jobs available in the United States but I wanted to come back to Canada because I was educated here, and I wanted to give back to the people of this country."

In his new role as a clinical investigator, he will try a number of different approaches, including gene therapy, to modulate the levels of free radicals in tumours, in order to reduce their size or eradicate them altogether. "When I was a resident, I used to see a lot of people coming through the door with oral cancer, and of course their main concern was whether the tumours were getting bigger or smaller, or whether they had reappeared." His ultimate goal is to develop new treatments for oral cancer that are more effective and less disfiguring for patients.

For Dr. Lam the university environment is an ideal work setting. "I really like everything the university has to offer me. I like the freedom that is associated with being here; I love the interaction with students, and the interaction with my colleagues," he says. While he's still in the process of setting up his lab, experience so far has validated his earlier decision not to become a practicing dentist.

Dr. Ernie Lam is a Heritage Clinical Investigator and an Associate Professor in the Department of Dentistry in the Faculty of Medicine and Dentistry at the University of Alberta. He also has an adjunct appointment as an Associate Professor at Edmonton's Cross Cancer Institute. Dr. Lam also receives support from the Canadian Institutes of Health Research.

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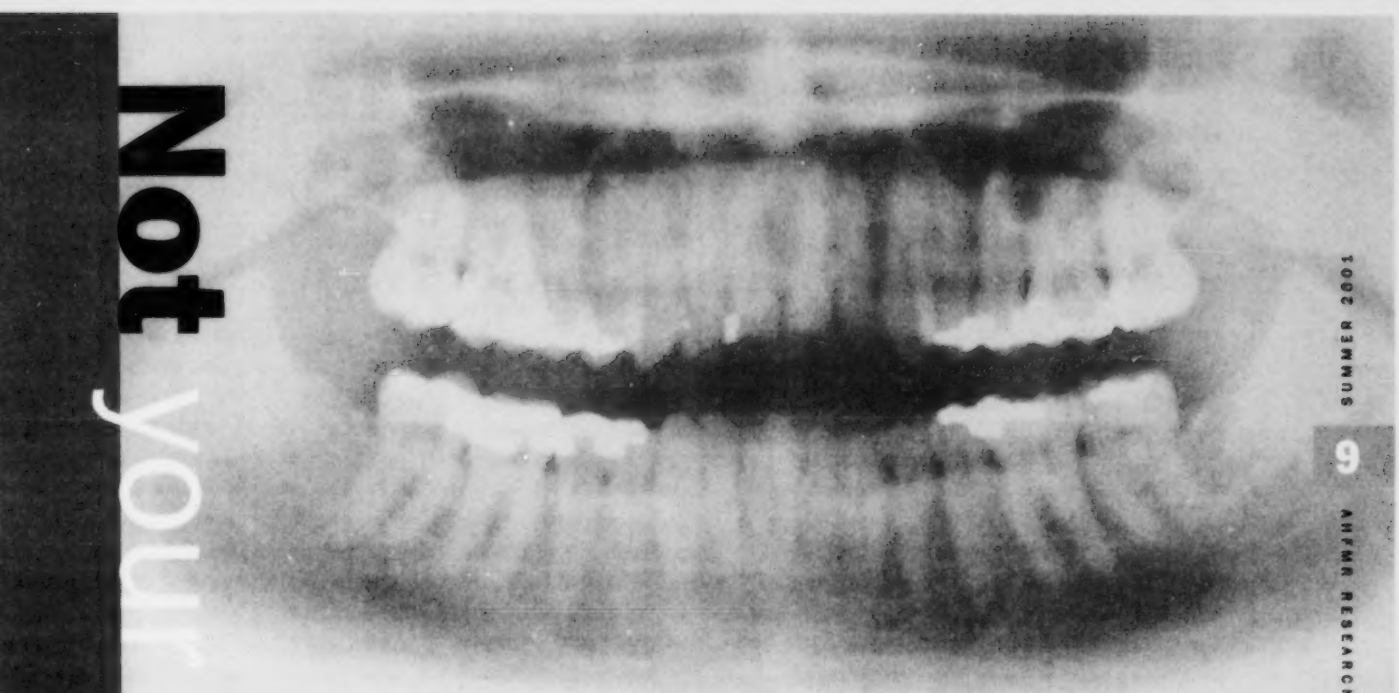

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Not your average dentist

sleep

He didn't set out to be an inventor. In fact, Remmers started out as a bench scientist whose main preoccupation was to better understand how the lungs work and how the brain controls breathing. But as his career progressed, he became a clinical scientist (he holds a medical degree) and his focus shifted increasingly to working with respiratory patients. The discovery of sleep apnea came in the 1970s, at around the same time as this professional shift in focus. Fast-forward to the present, and Remmers is a well-established sleep-disorder expert, and President and CEO of SagaTech Electronics Inc., a company that manufactures sleep-disorder technologies.

"Necessity," the saying goes, "is the mother of invention."

It's a notion that has been proven once again in the lab of Dr. John Remmers. Specifically, saving patients who were dying needlessly is what drove the Heritage researcher to develop the first of several patented devices used to diagnose and treat sleep disorders.

Origins of invention

"People were dying from sleep apnea," Remmers says of the early days of working in the sleep lab. "We knew how to treat them; we just didn't have the technology to do it."

Out of that frustration was born the nasal CPAP (continuous positive airway pressure) device, which consisted of a small bedside blower that generated low-level air pressure to force the air passage open and allow the patient to breathe normally. The

ABOVE: DR. JOHN REMMERS

Page 12 ▸

Sleep apnea

Is a potentially life-threatening condition that interrupts breathing during sleep. The most common types of the condition are obstructive and central sleep ap

▸ device proved to be highly effective for treating sleep apnea, and it caused few side effects, but it was cumbersome, and many patients had difficulty tolerating the fixed pressure it supplied. To remedy this, Remmers developed autoCPAP, a "smart" device that assesses the degree of airway obstruction and automatically adjusts the pressure supplied to the nose.

Funding from the Health Research Fund, administered by AHFMR for Alberta Health and Wellness, provided enough initial support to develop and test the device, which is still used to treat the disorder.

Obstructive sleep apnea, also known as "the snoring disease," is a chronic condition which causes patients to stop breathing briefly while asleep. This phenomenon occurs when the flesh and muscles of the tongue and throat relax so much that the airway is blocked and airflow is prevented. The consequent lack of oxygen in the blood prompts the patient to wake up and begin breathing again; this may occur with a loud snort or body jerk.

Central sleep apnea is the condition that occurs when the brain "forgets" to tell the muscles of the chest and diaphragm to keep breathing. Patients just stop breathing periodically, instead of jerking awake in order to resume breathing.

Apnea episodes can occur as many as 100 times per hour. As a result, patients rarely feel refreshed when they wake up, even if they've had 10 hours of "sleep".

Sleep apnea can have a dramatic effect on patients' physical and mental health. Such frequent disturbances in sleep often affect patients' ability to cope with their day-to-day routine. In addition to fatigue and excessive daytime sleepiness, patients are often irritable, depressed, and unable to think clearly; they may suffer from headaches. Body organs can be affected by the lack of oxygen. Apnea episodes may put increased pressure on the heart, causing it to work harder; this can increase blood pressure and put patients at risk for stroke.

As Remmers tells it, his latest invention was born over beers at a sports bar one afternoon after clinic rounds. "My colleagues and I didn't really know what we were doing back then, but maybe that's the ultimate in creativity," Remmers says. "You have a general idea of what you need, but the specifics are unknown to you." That first discussion eventually resulted in the SnoreSat Sleep Recorder, a portable recording device that can help make an in-home diagnosis of sleep apnea.

There are two waiting lists in Calgary, where Remmers is based. Getting diagnosed and treated for sleep apnea is often a long and arduous process. A patient must first be referred to a sleep doctor by a family physician. After that, it can take up to eighteen months to see a sleep specialist, another six months to get into the sleep lab to be evaluated, and up to two more months to receive therapy. That two-year process is common for uncomplicated forms of sleep apnea, although a patient suspected of having a more serious form of the disorder is seen sooner. "It's demoralizing for the family doctors, and it's demoralizing for the patients to know that it will take up to two years before they'll be treated," Remmers says.

In the meantime, the symptoms of sleep apnea can seriously affect a patient's personal and professional life. Severe sleep deprivation may contribute to reduced productivity at work, increased car and industrial accidents—sometimes leading to death—and increased healthcare costs.

Centrepiece technology

At present, a patient still goes to a sleep lab for diagnosis. If deemed necessary, a polysomnogram, a complicated test that measures 16 variables recorded during an overnight stay, is administered to help diagnose sleep apnea. An expert technician monitors the sleeping patient during the procedure, which can cost as much as $2000.

That may soon change, however. The SnoreSat Sleep Recorder allows a patient to be tested at home, eliminating inconvenient and expensive hospital stays. It's necessary to come to the hospital only to pick up the small device and get instructions on its use. The costs are $150 to administer.

Inventive work

It's been a long road to creating a viable product—about ten years from the time Remmers first saw a need, to the development, testing, and refinement of the sleep recorder. Remmers credits Eric Hajduk and Dr. Ron Platt, his partners in SagaTech Inc., the company that manufactures SnoreSat™, for their work in developing the device.

He met Hajduk when he was working in the sleep lab at Foothills Hospital. "SnoreSat was Eric's first project with me," Remmers says. "And since he was a mechanical engineer, I thought he could figure out how to measure all of the variables we'd determined to test for sleep apnea." A key breakthrough in the process came when Hajduk found a way to measure snoring sound with a microphone that senses the movement of the skin. The technique has now become the industry standard.

Platt, who was a graduate student working in a respiratory physiology lab at the hospital, teamed up with Hajduk to help develop SnoreSat. "We literally started out tinkering around in our basements," explains Platt, who holds a Ph.D. in respiratory medicine and an electrical engineering degree.

Without SnoreSat, the condition of one of my patients would not have been detected, and he probably would have died.

What the two novice inventors eventually helped create is an easy-to-use device about the size of a clock radio. Patients simply hook themselves up to three sensors—an oxygen probe is applied to the index finger, a microphone is taped to the base of the neck, and nasal cannulas are applied to the nose—turn on the bedside recorder, turn off the lights, and go to sleep. In the morning, the machine is turned off and returned to the sleep lab for analysis by computer and interpretation by a sleep expert. Results are then forwarded to the family doctor.

ABOVE: DR. RON PLATT (L) AND ERIC HAJDUK (R)

Clinical testing

SnoreSat is currently being used in home-care respiratory wellness programs in Kelowna, Calgary, Lethbridge, Cranbrook, and Winnipeg. Primary-care physicians order a sleep test, and the device is supplied by a home-care dealer. An expert—at this point, Remmers—interprets the data. This diagnostic pathway has already saved at least one life.

"I see lots of sick patients, but today I diagnosed one of the sickest folks I've seen since I was an intern 35 years ago," Remmers says. "Without SnoreSat, I don't think his condition would have been detected, and he probably would have died." The patient is now being treated successfully and enjoying a normal life. **Page 14 ▸**

▸ Remmers hopes that once SnoreSat is in widespread use, it will help speed diagnosis of sleep apnea, allow sleep specialists to focus on severe cases, and free up sleep labs for their intended purpose: to treat serious sleep disorders.

Things have progressed quickly since Hajduk and Platt set up SagaTech Inc. as a manufacturing arm for Remmers' research. They moved into their current office in south Calgary when Remmers became a partner two years ago.

Currently, SagaTech is planning for major clinical trials of the sleep recorder across North America. The pilot project has already proven the device's worth, but wider, neutral trials must be conducted to further establish its credibility. In addition, the company is working with Dr. Val Kirk, a pediatric respirologist, to adapt SnoreSat for use with children. They've added two channels that address the differences between child and adult sleep apnea.

SagaTech Inc. has also just received Technology Commercialization funding to develop sophisticated software that works with the SnoreSat Sleep Recorder monitor. The software will use additional information from SnoreSat to provide a variety of diagnoses. SagaTech is also developing other medical devices for the diagnosis and treatment of sleep disorders. The company has received Phase II TC funding to fine-tune a dental device that can help treat mild to moderate sleep apnea.

Dr. John Remmers is a Heritage Scientist and a Professor in the Department of Medicine and the Department of Physiology and Biophysics at the University of Calgary. He also receives research support from from the Canadian Institutes of Health Research (CIHR).

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FORE

A NEW LOOK FOR TECH

Since the establishment of AHFMR in 1980, there has been a concerted effort to undertake more technology commercialization in Alberta, thus keeping more of the economic benefits in the province. Unlike innovations in many industries, those in medicine and health are subject to substantial regulatory scrutiny, complex timelines, and high development costs.

"The long time cycle for innovation presents a significant challenge when we want to keep the innovation in Alberta," says Linda Humphreys, AHFMR Vice- President of Corporate Affairs and Commercialization. "Alberta has produced many start-up companies, but there is tremendous pressure to move mid- and later-stage development out of the province to places where venture capital and expertise in technology commercialization are easier to access."

Recognizing these limitations, the Heritage Foundation founded a formal Technology Commercialization (TC) program in 1985. Its mission is to assist Alberta innovators in transforming new ideas and scientific findings into successful commercial products and services. TC funding often fills the gap when a commercially promising project does not fit the mandate of agencies that fund medical research, yet is not sufficiently developed to attract outside investors.

Now there's a move to accelerate the commercialization of innovations resulting from medical research and technology development. Based on extensive consultation and discussion, AHFMR has refocused its TC program.

One of the major components of the new program is ForeFront, an advisory body which augments the three funding phases of the old program. Whereas the former TC model concentrated on funding, ForeFront assists innovators and their teams in understanding critical

sleep

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Opportunities abound

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Innovation is the name of the game—and it's a game that is played extremely well in Alberta. The pages of this magazine serve as a chronicle of the innovative medical and health research being done in the province. But how do brilliant research results get from the lab to the people who need them? In many cases, they come in the form of drugs and medical devices that are brought to market by entrepreneurs. This process of technology commercialization is a natural follow-through from successful medical and health research.

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"Early stage companies are the pipeline that feeds high-technology industries. It's vitally important that we nurture them. Forefront is keeping the pipeline alive." ALF SAILER

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FRONT

NOLOGY COMMERCIALIZATION

business issues and processes through interaction with a cadre of experts in technology, business, marketing and entrepreneurship.

"This is the unique aspect of ForeFront," notes Humphreys. "We've assembled a team of external experts and consultants along with a core advisory committee that is truly second to none. We have experts in intellectual property, investment banking, business development, market research, and many other areas. ForeFront is about commercialization assistance.

And that's what makes ForeFront an exciting new venture, says Committee member Dr. Mary Earle. She is a scientist (with a Ph.D. in pharmacology), an entrepreneur, and co-founder of Mind to Market Solutions Inc., a business development and consulting company to the life sciences industry.

"The ForeFront Committee is a team of private-sector knowledge experts who have a wide array of viewpoints. Each member brings a different group of skills to the table," says Earle. "The ForeFront process helps entrepreneurs understand the strengths and weaknesses in their TC application and in their overall business plan."

A key point, agrees ForeFront Committee member Ron Odynski. A partner at Ogilvie LLP, Odynski has been Counsel for AHFMR and the TC program for more than 10 years.

"ForeFront is about giving entrepreneurs access to strategic resources—not just money, but advice and people," he says. "As a lawyer, I usually critique things. On ForeFront, I use my experience and analytical skills to advance projects. ForeFront gets to applicants early and provides critical advice, which goes far beyond the yes/no of a conventional funding application."

The ForeFront Committee meets formally four times a year, and subgroups work throughout the year. The meetings consist of a review and discussion of four to six projects, followed by decisions on what kind of assistance should be offered. The appropriate Committee members are then assigned to work with the applicants. Funding recommendations are passed on to AHFMR's Technology Commercialization Committee.

"ForeFront allows us to help scientists with a whole set of issues," says committee member Dr. Irene Bridger, an intellectual property lawyer at Gowling Lafleur Henderson LLP in Calgary. She also has a Ph.D. in microbiology and worked as a researcher for a number of years. "For example, many scientists don't know a lot about protecting intellectual property, which is my specialty. Getting a patent isn't the whole story. The much larger and more important issue is developing a solid intellectual property strategy. This may include early protection, proper confidentiality and non-disclosure agreements, and ownership issues.

"There are many things that have to be sorted out right at the beginning. I've seen it happen too many times that inventors give up rights to an invention because they're not aware of how various contract decisions can affect ownership."

ForeFront aims to be in there early, helping entrepreneurs avoid some of the pitfalls, says Committee member Dr. Alfred Sailer, Vice-President of Corporate Finance at Acumen Capital Finance Partners Limited. His business expertise has a science foundation—Sailer is a Doctor of Dental Surgery.

"I'm in the investment banking business. The companies I see regularly are much farther advanced than the ones we review on the ForeFront Committee," Sailer says. "Yet these early-stage companies are the pipeline that feeds high-technology industries. It's vitally important that we nurture them. ForeFront is keeping the pipeline alive."

Mercury amalgam fillings

How is a snail like a typewriter? This absurd riddle sounds a bit like a playground joke circulated by seven-year-olds–or the Mad Hatter's "How is a raven like a writing-desk?" But University of Calgary neuroscientist Dr. Naweed Syed says the snail–typewriter comparison is a good analogy for the studies he is conducting on brain development and regeneration.

"If you look at the keyboard of a typewriter and that of a computer, everything is almost identical," explains the AHFMR Senior Scholar, a researcher in the University of Calgary's Respiratory and Neuroscience Research Groups. "But if you want to understand how the computer functions, the access is still through the keyboard. We are in a situation now where we first have to understand the keyboards, so we use simple animals, like snails. The snails are like typewriters. They provide us with the basic, fundamental information as to how Mother Nature may have configured things in the computers–the higher animals. These lower animals offer greater opportunity to understand or define the role of any given gene, and then one can extrapolate their function in human or other animal models."

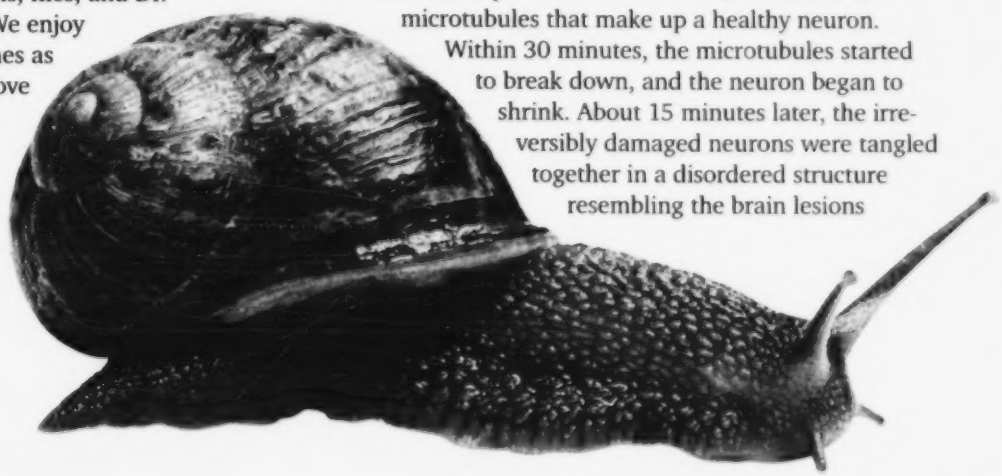
Dr. Syed's snails provided a rare opportunity to observe exactly how mercury affects the healthy brain cells.

Dr. Syed's research looks at how brain cells (neurons) recognize and connect with their partners, how they establish the intricate network of synapses that forms the basis of brain function, and how the brain repairs itself during regeneration. Though we flatter ourselves with the belief that we are higher beings, from a genetic perspective we are kissing cousins to worms, flies, and Dr. Syed's humble snails. We enjoy only twice as many genes as the worm; when we move up the ladder from worms and snails to flies, the gap narrows even further.

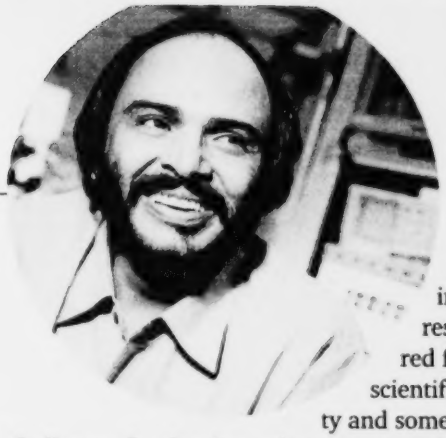
These resemblances made the snail model a particularly useful one for Dr. Syed's collaborator at the University of Calgary, Dr. Fritz Lorscheider, who studies the effects of mercury amalgam tooth fillings on the brain.

In landmark research in the early 1980s, Dr. Lorscheider and his team in the Department of Physiology and Biophysics showed that mercury vapour is released from fillings when we chew. In follow-up studies conducted on rats in 1997, his team and a group of researchers from the University of Kentucky showed that inhaling mercury vapour leads to the development of molecular lesions in the brain that are similar to the lesions found in 80% of Alzheimer-diseased brains. Because more than 90% of the amino acids that make up the microtubules (the main protein in the structure of the neuron) are the same across species, Dr. Syed's snails provided a rare opportunity to observe exactly how mercury affects the healthy brain cells. From these findings, Drs. Syed and Lorscheider would be able to extrapolate how it might be affecting the nervous systems of those of us who have mercury amalgam fillings, which are made from 50% mercury, 35% silver and 15% other metals.

Dr. Syed and AHFMR Summer Student Christopher Leong isolated and cultured neurons from snails. They then exposed the neurons to the same concentration of mercury that would be present in the urine of anyone who had seven or eight amalgam fillings. The mercury soon took effect on the bundles of microtubules that make up a healthy neuron. Within 30 minutes, the microtubules started to break down, and the neuron began to shrink. About 15 minutes later, the irreversibly damaged neurons were tangled together in a disordered structure resembling the brain lesions



and the brain

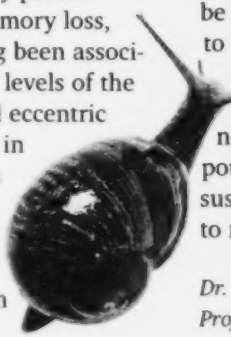


"Mercury toxicity has now been linked to autism in children and basic deformities to the neurosystem, to learning disabilities, and to many other forms of health hazards."

found in those with Alzheimer's disease. The researchers repeated the study using aluminum, lead, cadmium, and manganese, none of which caused this type of degeneration in the neurons.

As the cover story of April's issue of *NeuroReport*, the research garnered international attention and a flood of mail. The accompanying time-lapse video recording provided graphic evidence of their findings.

It's no secret that mercury is a highly potent neurotoxin. Tremors and twitches, memory loss, and loss of manual dexterity have long been associated with prolonged exposure to toxic levels of the metal. With his perplexing riddles and eccentric behaviour, Lewis Carroll's Mad Hatter in Alice's Adventures in Wonderland was a fanciful depiction of the effects of mercury on hat-makers, who suffered mercury poisoning from inhaling the fumes of the mercurous nitrate used in curing felt. More than a century later, evidence continues to mount against exposure to mercury in any form, whether ingested or inhaled as a vapour.



"Mercury toxicity has now been linked to autism in children and basic deformities to the neurosystem, to learning disabilities, and to many other forms of health hazards," says Dr. Syed. Another concern—and a personal interest of Dr. Syed's—is the Third World practice of using mercury to clean smoke-blackened cooking pots and utensils. "When the pots have been cleaned this way," he adds, "these people are consuming huge amounts of mercury in their food on a daily basis."

These uses of mercury aside, research over the past 15 years has clearly demonstrated that the biggest contributor to increased levels of mercury in humans is amalgam fillings. In one study, participants with mercury fillings were still excreting mercury in their urine years after the fillings had been put in place. The findings of this research raise red flags for the scientific community and some serious challenges for dentists, who are now trying to establish a policy that would see amalgam fillings banned in children under the age of 18. But the alternatives are expensive, and insurance companies would have to be prepared to shoulder the costs.

Dr. Syed is quick to point out that further studies are needed to determine the effects of mercury on brain cells with established connections and to show that the metal has the same effect in higher animals—"the computer"—as it does in his "typewriter" snails.

"I would be very surprised if this didn't turn out to be the case," he says. "These animals are more likely to be exposed to heavy metals like mercury in the water, and yet they still show enormous sensitivity to such compounds. Since we are normally not likely to be exposed to these compounds, I suspect that we would be even more susceptible to any changes caused by exposure to mercury."

Dr. Syed is an AHFMR Senior Scholar, and an Associate Professor in the Department of Cell Biology & Anatomy and the Department of Physiology & Biophysics at the University of Calgary. His research is also supported by the Canadian Institutes for Health Research, the Canadian Institutes of Health Research, and the National Science and Engineering Council of Canada.

The research of Dr. Fritz Lorscheider, a Professor in the Department of Physiology and Biophysics at the University of Calgary, is supported by the International Academy of Oral Medicine and Toxicology.

Christopher Leong was an AHFMR Summer Student in 1998-99. He is now a third-year medical student at the University of Alberta.

Recent publication:

Smit AB, Syed NI, Schapp D, Klumperman, J, Kits KS, Lodder H, van der Schors RC, van Elk R, Sorgedrager B, Brejc K, Sixma T, Geraerts WPM. AChBP, a glia-derived acetylcholine-receptor-like modulation of cholinergic synaptic transmission. *Nature* 2001; 411: 261-268 (and "News and Views" 252-253).

To screen or not to screen? This is a big question for researchers in cancer detection. "Every screening test has to be evaluated on its own merit," says AHFMR Population Health Investigator Dr. Elizabeth McGregor, a research scientist with the Alberta Cancer Board's Division of Epidemiology, Prevention and Screening. "You have to look at each test and ask: Is it effective? In which people is it effective? And if it is effective, how can we make sure everybody who could benefit is aware of it and accesses it?"

These are the questions researchers are currently asking about prostate cancer screening. Evidence shows that combining a digital examination with a blood test to measure the level of PSA (Prostate-Specific Antigen) can detect prostate cancer earlier. But there is no evidence from randomized controlled trials that offering screening to men aged 50 to 69 will actually reduce the number of men who die from the disease. Since prostate cancer has a long natural history, the results from two large studies now underway to assess the effectiveness of screening won't be available for another five to seven years.

"We usually need that really strong evidence before we can make public health recommendations and advocate that all men be screened," says Dr. McGregor. "So we're in a situation now where we have some groups advocating that men be screened and others saying there isn't enough evidence."

The introduction of the PSA test in 1990 has led to a dramatic increase in the number of men diagnosed with prostate cancer over the last decade. At the same time, the test has brought prostate cancer screening into the realm of controversy. Because PSA is a protein that is produced by normal and cancerous prostate tissue, benign disease of the prostate – a very common condition in men over 50 – can lead to a false positive test result. The test can also miss cancers. To add to the controversy, a significant number of men have latent prostate cancer. "If you autopsy men over the age of 50 who died of causes completely unrelated to prostate cancer, 30 percent of them will have had cancer in their prostate," says Dr. McGregor. "You don't really want to be identifying that because it was clinically insignificant. It was never going to be a problem for them."

In her research, Dr. McGregor is developing a shared decision-making tool that will help men who are considering prostate cancer screening make the decision together with their family doctor, the way post-menopausal women are encouraged to make decisions about hormone replacement therapy. She will work with physicians from the Alberta Family Practice Research Network to design and evaluate a tool that will work in this "real world" setting.

"Until now shared decision-making has been used mostly around treatment decisions, when there are a couple of treatments with different risks and benefits," says Dr. McGregor. "But there are likely going to be more and more of these kind of screening recommendations coming out, where patients are involved in the decision-making process. Our goal is to convey the information in a fair and balanced way, so patients can weigh the pros and cons themselves."

Weighing the pros and cons of prostate cancer screening

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and mathematics improve cancer treatment

Although a radiation oncologist prescribes the tumour dose for each particular patient, determining the absolute dose and the absorbed dose distribution is the responsibility of the medical physicist. "One of the things we try to do is optimize the radiation dose to the tumour and at the same time minimize radiation dose to normal tissue," says Dr. Mobit, a medical physicist at the Tom Baker Cancer Centre. Dr. Mobit is investigating ways of measuring the radiation dose for patients undergoing cancer treatment.

Dr. Mobit's specialty allows little room for error. In order to eradicate a primary tumour in a cancer patient, the dose must be correct to within five percent, a goal that he says is close to impossible to achieve for some cancers, especially lung cancer and cancers in the head and neck region. The detectors used to determine how much of the dose the patient has received must be accurate to one percent. But his research has shown that some of the underlying theories used to convert the measured signal for solid state detectors into absorbed dose to patients are themselves not accurate. He has developed and is refining a new theory to determine the radiation dose to within 0.5% for patients.

Dr. Mobit's other research also has important implications for cancer treatment. "Radiation treatment plans are based on radiation dose distribution calculated by a commercial treatment planning system that assumes the body is 100% water," he says. "The methods for calculating dosages do not accurately account for the parts of the patient that aren't water – for example, air cavities in the head and neck region (esophagus, pharynx, trachea), lung, and bone."

Dr. Mobit is now developing a treatment planning system based on a technique that uses random numbers and probability distributions to describe how radiation interacts with different types of body tissue. This Monte Carlo method tracks energy depositions by electrons and photons in tumors and organs close to the tumor site. It is by far the most accurate approach to radiation dose calculations for patients undergoing radiation therapy. For the most part, Monte Carlo treatment planning is still in its experimental stages, with only a couple of centres in the U.S. using the technique clinically, and even then on a very limited basis. Dr. Mobit hopes that the technique will be ready for clinical use in Alberta within the next few years. "But even if the Monte Carlo is not being used clinically," he says, "the radiation oncologist can still use the information to make a judgment and decide what changes should be made to radiation treatment plan."

Dr. Paul Mobit is a Heritage Health Independent Establishment Grant recipient. He is a Medical Physicist with the Tom Baker Cancer Centre-Alberta Cancer Board, and an Assistant Professor of Oncology, Faculty of Medicine, U of C. He is also an Adjunct Assistant Professor in the U of C's Department of Physics and Astronomy. His research is also supported by the Alberta Foundation for Cancer Research and he is a recipient of the 2001 Petro-Canada Young Innovator Award.

Recent publications:

Mobit P. N., Sandison G. A. and Nahum A. E. "Perturbation correction factors in solid state detectors irradiated in kilovoltage photon beams" *Phys. Med. Biol.* Vol. 45 267-277 (2000)

Mobit P. N., Sandison G. A. and Bloch C. "Depth ionization curves for an unmodulated proton beam measured with different ionization chamber" *Med. Phys* Vol. 27 2780-2787 (2000)

Evolution of a geneticist

After completing her B.Sc. in Molecular Biology and Genetics, southern Ontario native Lindsay Bridgland headed west with two purposes in mind: to pursue her master's degree in one of Canada's few medical genetics departments, and to do a bit of travelling along the way.

She had applied to both the University of British Columbia and the University of Alberta, but after visiting the lab of Dr. Heather McDermid, Lindsay was sold on studying in Edmonton. "Dr. McDermid is great. She's really supportive and easy to talk to," she says. "After meeting with her, I became very interested in the research that she was doing." The added incentive of a two-year Heritage Studentship clinched Lindsay's decision to move to Alberta.

Dr. McDermid works in the area of human genetics, with a focus on two conditions: cat eye syndrome, and the chromosome 22q11.2 deletion syndrome. Cat eye syndrome is a rare genetic condition resulting from a duplication of chromosome 22. It can result in catlike eyes, as well as such health complications as heart defects, kidney abnormalities, and anal atresia, the congenital absence of an anal opening.

Now finishing the second year of her master's program, Lindsay is studying the evolution of a new gene, CECR7 (cat eye critical region gene 7), which is in the repeat-rich region on human chromosome 22 associated with cat eye syndrome. This gene appears to have developed when pieces of the genome were duplicated and then integrated into chromosome 22.

While the McDermid lab has helped to document how the CECR7 gene was created, the scientists have yet to determine whether it is involved in cat eye syndrome. "We're not sure if it could play a role," Lindsay says. "It's really hard to test for, because the gene appears to be associated with many other places on the genome."

The second gene that the McDermid lab is studying—CECR1 (cat eye critical region gene 1)—is a candidate for involvement in cat eye syndrome.

Lindsay is helping to determine the function of this CECR1 gene in the development of normal embryos, in order to understand the detrimental effects it may have on developing fetuses when the gene is duplicated.

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Outside of academic pursuits, Lindsay is a keen soccer player and has an avid interest in fitness and nutrition. She's giving back to the research community by taking on a volunteer position with the University of Alberta Hospital's CAT-scan unit.

Lindsay is still weighing her options when it comes to future career plans. She's seriously considering a career in health research—either medical genetics or physiology—and may even stay "out west", depending on job offers or academic opportunities.

Lindsay Bridgland holds an AHFMR studentship as does Stephanie Maier, a third year student also working on Cat Eye Syndrome in Dr. Heather McDermid's lab. Dr. McDermid is the recipient of an AHFMR Major Equipment Grant.

Recent publication:

Footz TK et al. Analysis of the cat eye syndrome critical region in humans and the region of conserved synteny in mice: a search for candidate genes at or near the human chromosome 22 pericentromere. *Genome Research* 2001; 11: 1053-1070.

reader resources

Research Views

Institute of Health Economics:

www.ihe.ca

Life and Death Signals

Web sites:

www.signaltransduction.ualberta.ca

www.pmcol.ualberta.ca/dept/academics/echaves.html

Evolution of a geneticist

Dr. Heather McDermid's Web site

www.biology.ualberta.ca/mcdermid.hp/mcdermid.html

Inventing a Better Night's Sleep

Sleep Apnea Society of Alberta

www.sleep-apnea.ab.ca

SagaTech

www.sagatech.ca

Weighing the Pros and Cons of Prostate cancer screening

Canadian Cancer Society Web site

www.cancer.ca

Alberta guidelines for PSA testing

www.amda.ab.ca/cpg/index.html

Mercury Amalgam fillings and the brain

Society for Neuroscience

www.sfn.org/

How math and physics improve cancer treatment

Canadian Organization of Medical Physicists

www.medphys.ca/index.cfm

Dr. Mobit's Web site:

www.ucalgary.ca/~pmobit

Not Your Average Dentist

National Cancer Institute—Cancer Net Web site

cancernet.nci.nih.gov/Cancer_Types/Head_And_Neck_Cancer.shtml

Compru (Craniofacial Ossiointegration and Maxillofacial Prosthetic Rehabilitation)

http://www.caritas.ab.ca/compru/

Suneil is one of 42 students chosen from 154 applicants from across the province to participate in HYRS 2001, the second year of the program. He and 19 other students from Northern Alberta were introduced to the HYRS program and the University of Alberta on July 4. Twenty students from Southern Alberta were welcomed to the HYRS Program at the University of Calgary that same day, and in Lethbridge two student started in the HYRS Program on July 11.

Developed by the Alberta Heritage Foundation for Medical Research, HYRS provides a hands-on summer research opportunity for Grade 11 students which places students under the laboratory supervision and mentorship of world class Heritage funded researchers. At the end of the summer, students have to prepare a scientific poster about their project experience and knowledge.

Fifteen boys and 27 girls were chosen for HYRS 2001 and 17 of the students hail from communities outside Edmonton, Calgary or Lethbridge. Selection to the program is extremely competitive and is based on the student's marks (a minimum 85% average is required in math and science subjects), references from teachers and a person in the student's community, and a personal essay.

As tough as the application to HYRS was, Suneil points out that it was just a taste of things to come for HYRS students, who will be entering grade 12 in September and are approaching crunch time for making some decisions about their futures. HYRS offers the students a chance to immerse themselves in areas of study they may wish to pursue.

In addition to the outstanding lab experience, HYRS students also participate in field trips, guest lectures, tours, biosafety workshops, an open house, and poster sessions. Rounding out the six-week program is Teachers' Day when the students' science teachers are invited to join them for a day on campus. Teachers get the opportunity to see what the students have been working on and, in a reversal of roles, learn from their students. After the program ends, HYRS students are required to make a presentation on their experience to a science class in their high school.

LEFT: SUNEIL KHANNA, HYRS 2001 PARTICIPANT

"We are delighted with the response to the HYRS Program and with the calibre of the selected HYRS participants. HYRS is not just a summer job but a unique opportunity to get hands-on experience of research and one-on-one mentoring with some of the finest scientists in Canada. AHFMR is reaching out to the researchers of tomorrow by giving young Albertans an experience of research today," says Dr. Matt Spence, President and CEO of AHFMR.

"HYRS is a chance for students to try something they have never done," concludes Suneil. "You just don't get this kind of experience in a high school lab!"

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Physicians: please place in your patient waiting rooms.

Heritage Youth Researcher Summer (HYRS) Program 2001

"HYRS is a great opportunity to get into the workforce and see what you might be doing in 10 or 20 years," says Suneil Khanna, a grade 11 student from Old Sconna Academic High. As a participant in the Heritage Youth Researcher Summer (HYRS) Program, Suneil is spending six weeks this summer working in the lab of Dr. Peter Light, a Heritage researcher. Dr. Light's work in the Department of Pharmacology focuses on diabetes and cardiac disease and Suneil is working on a project combining molecular biology and electrochemistry.

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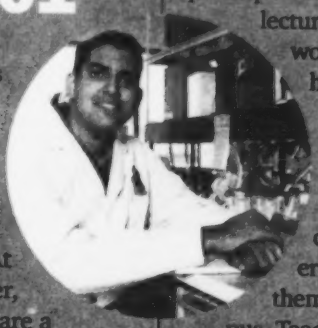

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